28. A method according to claim 23, wherein the at least one offset comprises a respective offset for each of the I and Q components of the digital signal.

REMARKS

The Examiner is thanked for the thorough examination of the present application. Independent Claim 1 has been canceled and the subject matter thereof re-written as newly added independent Claim 27 to more clearly define the Claim over the prior art. Independent Claims 9, 17, and 23 have been similarly amended. Dependent Claims 2-4, 6-9, 14, 16-18, 21-23 and 26 have been amended for consistency therewith, to correct certain minor typographical errors, and to more clearly define certain features of the invention in accordance with the specification. Claim 15 has been cancelled, and Claim 28 is newly added. Support for these amendments and newly added Claims may be found on pages 15-17 and 21 of the originally filed specification, and in FIGS. 6 and 14, for example. No new matter is being added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned "**Version with Markings to Show Changes Made**."

In view of the amendments and the supporting arguments presented in detail below, it is submitted that all of the claims are patentable.

I. The Claimed Invention

The present invention is directed to a method for transmitting information, particularly by way of a quadrature phase shift keyed (QPSK) waveform. As recited in independent Claim 27, for example, the method includes providing a data

signal representative of the information and comprising in-phase (I) and quadrature (Q) components. Furthermore, at least one of the I and Q components is biased with an offset. The method further includes generating a quadrature phase shift keyed (QPSK) waveform based upon a carrier signal and the at least one biased component, and transmitting the QPSK waveform.

Amended independent Claims 17 and 23 are directed to similar methods, and amended independent Claim 9 is directed to a related communication system. Each of these claims similarly recites that at least one of the I and Q components of the data signal is biased by an offset. As a result of such biasing, detection and recovery of the carrier from the received QPSK waveform is advantageously simplified in accordance with the claimed invention because non-linear regeneration is no longer required for carrier detection, as is the case with typical prior art systems.

II. The Claims Are Patentable

The Examiner rejected independent Claims 1, 9, 17, and 23 over Shockey. Shockey is directed to a modulation/demodulation system (i.e., a direct sequence spread spectrum system), and method for operating the same. The system includes a transmitting structure including first and second PN generators which produce distinct first and second PN sequences of equal length. A PN clock is associated with the generators for synchronizing the sequences. The second PN generator is connected to a tapped delay line which generates a plurality of symbols from the PN sequence, each symbol corresponding to a time offset of the second PN sequence by one or more chips with respect to the epoch of the first PN sequence. By using the delay between a symbol PN sequence and a second, pilot sequence to represent bit patterns containing two or more message bits, the modulation system purportedly

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enables more bits to be transmitted per symbol to therefore increase data rate transmission speeds.

The Examiner contends that Shockey discloses a method and system for modulating and receiving a QPSK signal as recited in independent Claims 1, 9, 17, and 23. However, as noted above, each of these claims has been amended to recite that the data signal which is modulated with the carrier signal to produce the QPSK waveform includes I and Q components, and that at least one of these I and Q components is biased by an offset. In contrast, the first and second PN generators of Shockey do not bias the I and Q components of the data signal thereof by an offset. Rather, these PN generators produce a time offset of the second PN sequence with respect to the first PN sequence. See, e.g., col. 3, lines 19-39, and col. 11, lines 23-36 of Shockey. Thus, Shockey fails to teach all of the elements recited in each of above noted independent claims, and the rejection thereof cannot stand for this reason.

Accordingly, it is submitted that independent Claims 1, 9, 17, and 23 are patentable over the prior art. Their respective dependent claims, which recite yet further distinguishing features, are also patentable over the prior art and require no further discussion herein.

CONCLUSIONS

In view of the amendments to the claims and the arguments presented above, it is submitted that all of the claims are patentable. Accordingly, a Notice of Allowance is respectfully requested in due course. Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

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In re Patent Application of:
COBB ET AL.
Serial No. **09/393,639**
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Respectfully submitted,

JOHN F. WOODSON, II
Reg. No. 45,236
Allen, Dyer, Doppelt, Milbrath
& Gilchrist, P.A.
255 S. Orange Avenue, Suite 1401
Post Office Box 3791
Orlando, Florida 32802
Telephone: 407/841-2330
Fax: 407/841-2343

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

The paragraph beginning at page 4, line 16 has been amended as follows:

At the receive site 20, signals received by an antenna 22 and associated low noise amplifier circuitry 23 are coupled to a demodulator loop, which supplies both I and Q carrier references[, as shown at 24]. To demodulate the data, the received signal is coupled to a carrier recovery or regeneration path 25 and a data recovery path 27. As shown in the spectral diagram of Figure 4, since no discrete carrier component is separately transmitted from the transmit site 10, the carrier must be 'regenerated' at the receive site 20.

The paragraph beginning at page 16, line 14 has been amended as follows:

This is diagrammatically illustrated in Figure 6, [by installing] as a summing unit [43I] 43 is installed in the in-phase data signal path[,] to which a voltage offset of + 0.k volts is applied. The insertion of this DC offset voltage shifts or biases the reference levels for the encoded in-phase data symbol stream to values of 1.k volts and (-1.0 + 0.k volts), as shown in Figure 8. The resultant phase quadrature modulated signals produced by mixers 42I and 42Q are then summed in a summing unit 44 to produce a composite QPSK signal, that is transmitted via amplifier-feed circuitry 45 coupled to an antenna 46.

In the Claims:

Claim 1 has been canceled.

Claims 2-4, 6-9, and 14 have been amended as follows:

2. (Amended) A method according to claim [1] 27, further including the steps of:

[(c)] receiving the transmitted QPSK waveform [transmitted in step (b)]; and

[(d)] processing the received QPSK waveform [received in step (c)] to extract said carrier signal therefrom.

3. (Amended) A method according to claim 2, further including the step of:

[(e)] processing the received QPSK waveform [received in step (c)] using the carrier signal extracted therefrom [in step (d)] to derive said data signal.

4. (Amended) A method according to claim 3, wherein said data signal is encoded with a forward error correction code, and further including the step [(f)] of decoding the encoded data signal to recover said information from said data signal.

6. (Amended) A method according to claim [1] 27, wherein [step (a) comprises spreading energy of said carrier signal within said QPSK waveform] the offset comprises a spreading waveform.

7. (Amended) A method according to claim [6] 27, wherein [step (a) biasing further comprises modulating said data signal with a spreading waveform to produce a carrier-spreading signal, and multiplying relatively quadrature components of said carrier signal with said carrier-spreading signal to produce said QPSK waveform containing said prescribed

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amount of energy of said carrier signal] generating the QPSK waveform comprises multiplying the carrier signal with the digital signal.

8. (Amended) A method according to claim [7] 27, wherein [step (a) comprises imparting offsets to logic levels of said data signal in accordance with said spreading waveform to produce said carrier-spreading signal, and multiplying relatively quadrature components of said carrier signal with said carrier-spreading signal to produce said QPSK waveform containing said prescribed amount of energy of said carrier signal] wherein the offset comprises a direct current (DC) voltage.

9. (Amended) A communication system comprising:

a quadrature phase shift keyed (QPSK) waveform generator[, which is operative to produce] for generating a QPSK waveform [in accordance with] based upon a carrier signal and a data signal [whose contents are representative of information, such that a prescribed amount of energy of said carrier signal is injected into said QPSK waveform], the data signal being representative of information to be transmitted and comprising I and Q components, and said QPSK waveform generator biasing at least one of the I and Q components with an offset prior to generating the QPSK waveform; and

a transmitter [which is operative to transmit said] for transmitting the QPSK waveform produced by said QPSK waveform generator.

14. (Amended) A communication system according to claim 9, wherein [said QPSK waveform generator is operative to spread energy of said carrier signal within said QPSK waveform] the offset comprises a spreading waveform.

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Claim 15 has been cancelled.

Claims 16-18, 21-23 and 26 have been amended as follows:

16. (Amended) A communication system according to claim [15] 9, [wherein said QPSK waveform generator is operative to shift logic levels of said data signal in accordance with said spreading waveform to produce said carrier-spreading signal, and to multiply relatively quadrature components of said carrier signal with said carrier-spreading signal to produce said QPSK waveform containing said prescribed amount of energy of said carrier signal] wherein the offset comprises a direct current (DC) voltage.

17. (Amended) A method comprising the steps of:

(a) providing a carrier signal comprising in-phase (I) and quadrature (Q) components;

(b) providing a data signal comprising I and Q components and biasing the I and Q components of the data signal with at least one offset; and

(c) combining [relative quadrature versions of said carrier signal with said data signal in such a manner as] the I and Q components of the carrier signal with the biased I and Q components of the data signal, respectively, to produce a quadrature phase shift keyed (QPSK) waveform [having a power spectrum that contains a prescribed amount of carrier signal power].

18. (Amended) A method according to claim 17, further including the steps of:

(d) transmitting the QPSK waveform produced in step

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(c);

(e) receiving the QPSK waveform transmitted in step (d);

[(e)] (f) conducting non-regenerative recovery of the QPSK waveform received in step (e) to extract said carrier signal therefrom; and

[(f)] (g) processing the QPSK waveform received in step (e) using the carrier signal extracted therefrom in step [(e)] (f) to recover said data signal.

21. (Amended) A method according to claim 17, wherein [step (c) comprises spreading power of said carrier signal within the power spectrum of said QPSK waveform] the offset comprises at least one of a spreading waveform and a direct current (DC) voltage.

22. (Amended) A method according to claim 21, wherein [step (c) comprises modulating said data signal with a spreading waveform to produce a carrier-spreading signal, and multiplying relatively quadrature components of said carrier signal with said carrier-spreading signal to produce said QPSK waveform containing said prescribed amount of carrier signal power spread therein] combining comprises multiplying the I and Q components of the carrier signal with the biased I and Q components of the data signal, respectively.

23. (Amended) A method comprising the steps of:

(a) receiving a quadrature phase shift keyed (QPSK) waveform having [relative] in-phase (I) and quadrature (Q) components of a carrier modulated with I and Q components of a data signal, at least one of the I and Q components of the data signal being biased by an offset; and

(b) conducting non-regenerative recovery of the QPSK

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waveform received in step (a) to extract said carrier signal based upon the offset.

26. (Amended) A method according to claim 23, wherein [QPSK waveform has been produced by modulating said data signal with a spreading waveform to produce a carrier-spreading signal, and multiplying relatively quadrature components of said carrier signal with said carrier-spreading signal to produce said QPSK waveform containing a prescribed amount of carrier signal power spread therein] the at least one offset comprises at least one of a spreading waveform and a direct current (DC) voltage.

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: DIRECTOR, U.S. PATENT AND TRADEMARK OFFICE, WASHINGTON, D.C. 20231, on this 10th day of July, 2002.